

CLAIMS

1. An airbag module for protecting an occupant of a vehicle from impact, the airbag module comprising:

a cushion that inflates from a compacted configuration to protect the occupant from impact; and

a housing shaped to keep the cushion in the compacted configuration until inflation, wherein the housing is formed substantially of a flexible material, the housing comprising an attachment throat attachable to the vehicle;

wherein the cushion is attached to the housing such that the inflation gas expels the cushion from the housing through the attachment throat and flows into the cushion to inflate the cushion.

2. The airbag module of claim 1, wherein the housing comprises a first bracket attached to the attachment throat and to an inlet of the cushion, wherein the first bracket comprises at least one attachment feature that facilitates attachment of the bracket to the vehicle.

3. The airbag module of claim 2, further comprising a second bracket, wherein adjacent portions of the attachment throat and the inlet are sandwiched between the first and second brackets.

4. The airbag module of claim 2, wherein the attachment throat is formed as a single piece with at least a portion of the cushion.

5. The airbag module of claim 4, wherein the attachment throat comprises a pleat attached to the first bracket.

6. The airbag module of claim 1, further comprising an inflator contained within the housing, wherein the inflator produces inflation gas in response to receipt of an activation signal.

7. The airbag module of claim 6, wherein the attachment throat is part of an outer wall, the housing comprising a barrier formed of a flexible material, wherein the barrier is positioned between the inflator and the cushion in the compacted configuration to provide an inflator retention portion containing the inflator and a cushion retention portion containing the cushion in the compacted configuration.

8. The airbag module of claim 7, wherein the inflator comprises a diffuser extending through a first orifice of the barrier such that the diffuser is positioned generally within the cushion retention portion.

9. The airbag module of claim 8, wherein the diffuser extends from proximate a center of the inflator, along a direction generally perpendicular to an axis of the inflator.

10. The airbag module of claim 8, wherein the barrier is formed by first and second flaps extending from the outer wall, wherein the first orifice is formed in the first flap, wherein the first and second flaps are wrapped around the inflator along opposite directions, wherein the diffuser extends through a second orifice formed in the second flap.

11. The airbag module of claim 8, wherein the barrier is formed by a fabric wall extending between opposing sides of the outer wall, wherein the outer wall comprises first and second retention portions that extend around the inflator such that the inflator is retained between the barrier and the retention portions.

12. The airbag module of claim 1, wherein the attachment throat is attachable to an instrument panel of the vehicle such that the airbag module is suspended within the instrument panel.

13. The airbag module of claim 12, wherein the housing comprises at least one vent formed in the flexible material and positioned to vent gas into the instrument panel during inflation of the cushion.

14. An airbag module for protecting an occupant of a vehicle from impact, the airbag module comprising:

an inflator that produces inflation gas in response to receipt of an activation signal;

a cushion that receives the inflation gas and inflates from a compacted configuration to protect the occupant from impact; and

a housing mountable within an instrument panel of the vehicle to contain the inflator and the cushion in the compacted configuration, wherein the housing is formed substantially of a flexible material.

15. The airbag module of claim 14, wherein the housing comprises an attachment throat attachable to the vehicle, and a first bracket attached to the attachment throat and to an inlet of the cushion, wherein the first bracket comprises at least one attachment feature that facilitates attachment of the bracket to the vehicle.

16. The airbag module of claim 15, further comprising a second bracket, wherein adjacent portions of the attachment throat and the inlet are sandwiched between the first and second brackets.

17. The airbag module of claim 15, wherein the attachment throat is formed as a single piece with at least a portion of the cushion.

18. The airbag module of claim 17, wherein the attachment throat comprises a pleat attached to the first bracket.

19. The airbag module of claim 14, wherein the housing comprises an outer wall and a barrier formed of a flexible material, wherein the barrier is positioned between the inflator and the cushion in the compacted configuration to provide an inflator retention portion containing the inflator and a cushion retention portion containing the cushion in the compacted configuration.

20. The airbag module of claim 19, wherein the inflator comprises a diffuser extending through a first orifice of the barrier such that the diffuser is positioned generally within the cushion retention portion.

21. The airbag module of claim 20, wherein the diffuser extends from proximate a center of the inflator, along a direction generally perpendicular to an axis of the inflator.

22. The airbag module of claim 20, wherein the barrier is formed by first and second flaps extending from the outer wall, wherein the first orifice is formed in the first flap, wherein the first and second flaps are wrapped around the inflator along opposite directions, wherein the diffuser extends through a second orifice formed in the second flap.

23. The airbag module of claim 20, wherein the barrier is formed by a fabric wall extending between opposing sides of the outer wall, wherein the outer wall comprises first and second retention portions that extend around the inflator such that the inflator is retained between the barrier and the retention portions.

24. An airbag module for protecting an occupant of a vehicle from impact, the airbag module comprising:

an inflator that produces inflation gas in response to receipt of an activation signal;

a cushion that receives the inflation gas and inflates from a compacted configuration to protect the occupant from impact; and

a housing comprising an outer wall, at least a portion of which is formed as a single piece with at least a portion of the cushion, wherein the housing contains the inflator and keeps the cushion in the compacted configuration until inflation.

25. The airbag module of claim 24, wherein the housing comprises an attachment throat attachable to the vehicle, and a first bracket attached to the attachment throat and to an inlet of the cushion, wherein the first bracket comprises at least one attachment feature that facilitates attachment of the bracket to the vehicle.

26. The airbag module of claim 25, wherein the attachment throat comprises a pleat attached to the first bracket.

27. The airbag module of claim 24, wherein the housing further comprises a barrier formed of a flexible material, wherein the barrier is positioned between the inflator and the cushion in the compacted configuration to provide an inflator retention portion containing the inflator and a cushion retention portion containing the cushion in the compacted configuration.

28. The airbag module of claim 27, wherein the inflator comprises a diffuser extending through a first orifice of the barrier such that the diffuser is positioned generally within the cushion retention portion.

29. The airbag module of claim 28, wherein the diffuser extends from proximate a center of the inflator, along a direction generally perpendicular to an axis of the inflator.

30. The airbag module of claim 28, wherein the barrier is formed by first and second flaps extending from the outer wall, wherein the first orifice is formed in the first flap, wherein the first and second flaps are wrapped around the inflator along opposite directions, wherein the diffuser extends through a second orifice formed in the second flap.

31. The airbag module of claim 28, wherein the barrier is formed by a fabric wall extending between opposing sides of the outer wall, wherein the outer wall comprises first and second retention portions that extend around the inflator such that the inflator is retained between the barrier and the retention portions.

32. A method for protecting an occupant of a vehicle from impact through the use of an airbag module comprising an inflator, a cushion, and a housing having an attachment throat, the method comprising:

transmitting an activation signal to the inflator to trigger egress of inflation gas from the inflator;

conducting the inflation gas through the housing to expel the cushion from the housing through the attachment throat, wherein the attachment throat is attached to the vehicle and the housing is formed substantially of a flexible material; and

conducting the inflation gas into the cushion from the housing via the attachment throat to inflate the cushion.

33. The method of claim 32, wherein the attachment throat is part of an outer wall, the housing comprising a barrier formed of a flexible material, wherein the barrier is positioned between the inflator and the cushion in the compacted configuration to provide an inflator retention portion containing the inflator and a cushion retention portion containing the cushion in the compacted configuration, wherein conducting the inflation gas through the housing comprises moving the inflation gas across the barrier, from the inflator retention portion to the cushion retention portion.

34. The method of claim 33, wherein the inflator comprises a diffuser extending through a first orifice of the barrier such that the diffuser is positioned generally within the cushion retention portion, wherein moving the inflation gas across the barrier comprises moving the inflation gas through the first orifice and into the diffuser.

35. The method of claim 34, wherein the diffuser extends from proximate a center of the inflator, along a direction generally perpendicular to an axis of the inflator, wherein moving the inflation gas through the first orifice and into the diffuser comprises moving the inflation gas generally perpendicular to the axis.

36. The method of claim 34, wherein the barrier is formed by first and second flaps extending from the outer wall, wherein the first orifice is formed in the first flap, wherein the first and second flaps are wrapped around the inflator along opposite directions, wherein the diffuser extends through a second orifice formed in the second flap, the method further comprising moving the inflation gas through the second orifice.

37. The method of claim 34, wherein the barrier is formed by a fabric wall extending between opposing sides of the outer wall, wherein the outer wall comprises first and second retention portions that extend around the inflator such that the inflator is retained between the barrier and the retention portions, wherein moving the inflation gas through the barrier comprises moving the inflation gas through the fabric wall.

38. The method of claim 32, wherein the attachment throat is attachable to an instrument panel of the vehicle such that the airbag module is suspended within the instrument panel, wherein expelling the cushion from the housing comprises expelling the cushion from the instrument panel.

39. The method of claim 38, wherein the housing comprises at least one vent formed in the flexible material, the method further comprising venting inflation gas into the instrument panel through the vent.

40. A method for manufacturing an airbag module for protecting an occupant of a vehicle from impact, the airbag module comprising a cushion, an inflator having a diffuser, and a housing having a cushion retention portion and a first orifice adjacent to the cushion retention portion, the method comprising:

inserting the diffuser through the first orifice such the diffuser is positioned substantially within the cushion retention portion;

wrapping a portion of the housing at least partially around the inflator to retain the inflator; and

inserting the cushion into the cushion retention portion.

41. The method of claim 40, wherein the housing comprises an outer wall and a barrier formed of a flexible material in which the first orifice is formed, wherein the barrier provides the cushion retention portion and an inflator retention portion, the method further comprising inserting the inflator into the inflator retention portion by disposing the inflator to rest against the barrier.

42. The method of claim 41, wherein the housing further comprises first and second flaps extending from the outer wall, wherein the first orifice is formed in the first flap, the method further comprising inserting the diffuser through the second orifice, wherein wrapping a portion of the housing at least partially around the inflator comprises wrapping the first and second flaps around the inflator along opposite directions.

43. The method of claim 41, wherein the barrier is formed by a fabric wall extending between opposing sides of the outer wall, wherein the outer wall comprises first and second retention portions, wherein inserting the inflator into the inflator retention portion comprises moving the inflator between the first and second retention portions, wherein wrapping a portion of the cushion at least partially around the inflator comprises positioning the first and second retention portions to extend around the inflator such that the inflator is retained between the barrier and the retention portions.

44. The method of claim 41, wherein the inflator comprises a main body, wherein the diffuser extends from proximate a center of the main body, along a direction generally perpendicular to an axis of the main body, wherein disposing the inflator to rest against the barrier comprises disposing the main body to rest against the barrier.

45. The method of claim 40, wherein the inflator comprises a recess positioned proximate the diffuser, wherein inserting the diffuser through the first orifice comprises engaging the recess with the first orifice to restrict withdrawal of the diffuser from the first orifice.

46. The method of claim 40, wherein inserting the cushion into the cushion retention portion comprises folding the cushion along an established fold pattern.

47. The method of claim 40, wherein inserting the cushion into the cushion retention portion comprises compacting the cushion substantially independent of any established fold pattern.